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EXAMINER	
HON, SOW FUN	
ART UNIT	**PAPER NUMBER**
1794	
NOTIFICATION DATE	**DELIVERY MODE**
12/17/2007	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No.	Applicant(s)	
	10/562,050	KOMITOV ET AL.	
	Examiner	Art Unit	
	Sow-Fun Hon	1794	

-- *The MAILING DATE of this communication appears on the cover sheet with the correspondence address* --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-4 and 6-19* is/are rejected.

7)☒ Claim(s) *5 and 20* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *23 December 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *10/07,01/06,12/05*.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

1. Claims 6-7, 9-10, 12 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

a. Claims 6-7, 9 recite the phrase "termed preferred field-off" which is be better stated as "which is the preferred field-off".

b. Claim 6 recites "said preferred planar orientation" which is actually "said preferred field-off planar orientation".

c. Claim 7 recites "said preferred vertical orientation" which is actually "said preferred field-off vertical orientation".

d. Claim 9 recites the qualifier "whereas" in front of the phrase "an orthogonal projection of said surface-director, termed projected surface-director, presents said preferred orientation in a geometrical plane in parallel with said substrate, termed preferred field-induced planar orientation." It is unclear whether the term "whereas" is being used to further define the field-induced second planar orientation, in which case, the term "wherein" is more commonly used, or whether the term "whereas" is used in the ordinary sense of the word which introduces a contradictory statement. For the purposes of examination, the term "whereas" is interpreted as being used to further define the field-induced second planar orientation.

e. Claim 12 recites the phrase “each side-chain of at least some of the side-chains”, which can be shortened to say “at least some of the side-chains”.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 1-4, 9-12, 14-15, 17-19 are rejected under 35 U.S.C. 102(e) as being anticipated by Miyachi (US 6,985,200).

Regarding claim 1, Miyachi teaches a liquid crystal device (liquid crystal display device, column 2, lines 50-55) comprising a liquid crystal bulk layer presenting a surface-director at a bulk surface thereof (liquid crystal layer changes its orientation state, column 6, lines 5-6), and a surface-director alignment layer (first switching layer provided between the first electrode layer and the liquid crystal layer, column 6, lines 1-6) comprising side-chains (rigid liquid crystal skeleton directly bonded to a polymer main chain, column 12, lines 49-51) arranged to interact with the liquid crystal bulk layer at said bulk surface for facilitating the obtaining of a preferred orientation of the surface-director of the bulk layer (the liquid crystal layer changes its orientation state as the

molecules included in the first switching layer change orientation direction, column 6, lines 10-13), wherein the orientation of the molecules of the liquid crystal bulk layer is directly controllable by an electric field via dielectric coupling (liquid crystal material with positive anisotropy is included in liquid crystal layer 30, liquid crystal molecules 30a will also make switching outside of the plane as being affected by the voltage applied, column 14, lines 14-22). Miyachi calls the surface-director alignment layer that is arranged to interact with the liquid crystal bulk layer at the bulk surface, a switching layer to distinguish it from the underlying alignment layer (column 11, lines 35-41). Miyachi teaches that both the surface-director alignment layer and the underlying alignment layer preferably include a functional group with a great dipole moment (column 11, lines 50-59) wherein the functional group with great dipole moment is a ferroelectric liquid crystal side-chain (column 15, lines 10-17, ferroelectric liquid crystal material, polymerizable compound, for switching layer, column 12, lines 24-30), the orientation of which is directly controllable by an electric field (change orientation direction in response to a voltage applied, column 6, lines 7-10) via dielectric coupling (easily realized by the interactions between the dipoles, column 11, lines 55-59).

Regarding claims 2-3, Miyachi teaches that the liquid crystal bulk layer can exhibit positive dielectric anisotropy in one embodiment (column 14, lines 12-20), and negative dielectric anisotropy in an alternate embodiment (column 14, lines 30-35). Thus, although Miyachi fails to disclose the sign of the dielectric anisotropy of the surface-director alignment layer (column 11, lines 50-59), it would be opposite to the

sign of the dielectric anisotropy of the liquid crystal bulk layer in one embodiment, and the same in the alternate embodiment.

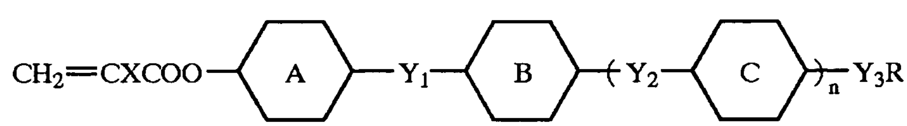
Regarding claim 4, Miyachi teaches that the first surface-director alignment layer and the second surface-director alignment layer exhibit opposite signs of dielectric anisotropy (molecule 16a in the one switching layer 16 and the molecule in the other switching layer 26 behave as having mutually opposite spontaneous polarizations towards an applied voltage with a polarity, column 8, lines 54-57). Thus, Miyachi teaches in one embodiment, that the liquid crystal bulk layer and the first surface-director alignment layer exhibit dielectric anisotropies of opposite signs, while the liquid crystal bulk layer and the second surface-director alignment layer exhibit dielectric anisotropies of the same sign, since the second surface-director alignment layer exhibits the opposite sign of dielectric anisotropy to the dielectric anisotropy of the first surface-director alignment layer.

Regarding claim 9, Miyachi teaches that the liquid crystal device further comprises at least one confining substrate (column 6, lines 15-20), and wherein the orientation of the liquid crystal molecules of said bulk layer is directly controllable by an applied electric field to perform an in-plane switching of an initial first planar orientation to a field-induced second planar orientation (in-plane switching, when the voltage is applied, column 14, lines 30-36), which means that the orthogonal projector of the surface-director, termed projection surface-director by Applicant, presents the preferred field-induced planar orientation of Applicant.

Regarding claim 10, Miyachi teaches that one way of providing an in-plane switching of the liquid crystal molecules is to apply an electric field in parallel with layer of liquid crystal molecules (lateral electric field is generated parallel to the surface of nematic liquid crystal layer, column 1, lines 27-35).

Regarding claims 11, 17-19, Miyachi teaches that the liquid crystal bulk layer preferably comprises a nematic liquid crystal (column 4, lines 62-64).

Regarding claim 12, Miyachi teaches that the surface-director alignment layer comprises a polymer having a polymeric backbone (switching layers 16 and 26 preferably include a polymer liquid crystal or a polymer material, column 12, lines 12-16, polymer main chain, column 12, lines 50-56) and side-chains attached thereto (rigid liquid crystal skeleton is directly bonded to a polymer main chain, column 12, lines 48-55), said polymeric backbone lacks directly coupled ring structures (polymer main chain obtained by polymerizing this type of monofunctional (meth)acrylates together [to form poly(meth)acrylates], column 12, lines 50-65), obtained from the compound represented by the formula below (column 12, lines 54-65):



In the formula above, Miyachi teaches that at least some of the side-chains (i) comprises at least two unsubstituted phenyls coupled via a carbon-carbon single bond (A, B may represent 1,4-phenylene groups, Y1 may represent single bond, column 13, lines 1-7), (ii) exhibits a permanent or induced dipole moment that in ordered phase provides dielectric anisotropy (the two molecules in the switching layers each include a

functional group with a great dipole moment, column 11, lines 55-60), (iii) is attached to the polymeric backbone via at least two spacing atoms (-COO-, which is connected to the C of the CX part of the polymerized CH_2=CX-, column 12, lines 60-65, which is the –$[CH_2\text{-}CX]_n$- polymer main chain).

Regarding claim 14, Miyachi teaches a method for manufacturing a liquid crystal device (method for fabricating a liquid crystal element, column 1, lines 7-14, liquid crystal display device, column 2, lines 50-55) comprising the steps of: providing a surface-director alignment layer on an inner surface of at least one substrate (first switching layer provided between the first electrode layer and the liquid crystal layer, column 6, lines 1-6, electrode layer forms the inner surface of a substrate) and sandwiching a liquid crystal bulk layer between two substrates (a liquid crystal layer provided between the first and second substrates, column 5, lines 62-67), said liquid crystal bulk layer presenting a surface-director at a bulk surface thereof (orientation state, column 6, lines 10-11), and a surface-director alignment layer comprising side-chains (switching layers 16 and 26, column 12, lines 12-16, rigid liquid crystal skeleton directly bonded to a polymer main chain, column 12, lines 49-51) arranged to interact with the liquid crystal bulk layer at said bulk surface for facilitating the obtaining of a preferred orientation of the surface-director of the bulk layer (the liquid crystal layer changes its orientation state as the molecules included in the first switching layer change orientation direction, column 6, lines 10-13), wherein the orientation of the molecules of the liquid crystal bulk layer is directly controllable by an electric field via dielectric coupling (liquid crystal material with positive anisotropy is included in liquid

crystal layer 30, liquid crystal molecules 30a will also make switching outside of the plane as being affected by the voltage applied, column 14, lines 14-22). wherein the orientation of the molecules of the liquid crystal bulk layer is directly controllable by an electric field via dielectric coupling (liquid crystal material with positive anisotropy is included in liquid crystal layer 30, liquid crystal molecules 30a will also make switching outside of the plane as being affected by the voltage applied, column 14, lines 14-22). Miyachi calls the surface-director alignment layer that is arranged to interact with the liquid crystal bulk layer at the bulk surface, a switching layer to distinguish it from the underlying alignment layer (column 11, lines 35-41). Miyachi teaches that both the surface-director alignment layer and the underlying alignment layer preferably include a functional group with a great dipole moment (column 11, lines 50-59) wherein the functional group with great dipole moment is a ferroelectric liquid crystal side-chain (column 15, lines 10-17, ferroelectric liquid crystal material, polymerizable compound, for switching layer, column 12, lines 24-30), the orientation of which is directly controllable by an electric field (change orientation direction in response to a voltage applied, column 6, lines 7-10) via dielectric coupling (easily realized by the interactions between the dipoles, column 11, lines 55-59).

Regarding claim 15, Miyachi teaches a method of controlling a liquid crystal bulk layer comprising the step of aligning a liquid crystal bulk layer presenting a surface-director at a bulk surface thereof by use of a surface-director alignment layer (the liquid crystal layer changes its orientation state as the switching layers change orientation directions, column 6, lines 1-10) comprising side-chains (rigid liquid crystal skeleton

directly bonded to a polymer main chain, column 12, lines 49-51) arranged to interact with the liquid crystal bulk layer at said bulk surface for facilitating the obtaining of a preferred orientation of the surface-director of the bulk layer (the liquid crystal layer changes its orientation state as the molecules included in the first switching layer change orientation direction, column 6, lines 10-13) wherein the orientation of the molecules of the liquid crystal bulk layer and the orientation of said side-chains of the surface-director alignment layer each is directly controllable by an orientation of the molecules of the liquid crystal bulk layer is directly controllable by an electric field via dielectric coupling (liquid crystal material with positive anisotropy is included in liquid crystal layer 30, liquid crystal molecules 30a will also make switching outside of the plane as being affected by the voltage applied, column 14, lines 14-22). Miyachi calls the surface-director alignment layer that is arranged to interact with the liquid crystal bulk layer at the bulk surface, a switching layer to distinguish it from the underlying alignment layer (column 11, lines 35-41). Miyachi teaches that both the surface-director alignment layer and the underlying alignment layer preferably include a functional group with a great dipole moment (column 11, lines 50-59) wherein the functional group with great dipole moment is a ferroelectric liquid crystal side-chain (column 15, lines 10-17, ferroelectric liquid crystal material, polymerizable compound, for switching layer, column 12, lines 24-30), the orientation of which is directly controllable by an electric field (change orientation direction in response to a voltage applied, column 6, lines 7-10) via dielectric coupling (easily realized by the interactions between the dipoles, column 11, lines 55-59).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 6-8, 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Miyachi as applied to claims 1-4, 9-12, 14-15, 17-19 above, and further in view of Robinson (US 5,973,817).

Miyachi teaches a liquid crystal device comprising a liquid crystal bulk layer presenting a surface-director at a bulk surface thereof, and a surface-director alignment layer comprising side-chains arranged to interact with the bulk layer at said bulk surface for facilitating the obtaining of a preferred orientation of the surface-director of the bulk layer, wherein the orientation of the molecules of the liquid crystal bulk layer and the orientation of said side-chains of the surface-director alignment layer each is directly controllable by an electric field via dielectric coupling, wherein the liquid crystal bulk layer and the surface-director alignment layer exhibit dielectric anisotropies of opposite signs, as described above. In addition, Miyachi teaches that the liquid crystal device further comprises at least one confining substrate (column 6, lines 15-20) wherein the orientation of the liquid crystal molecules of said bulk layer is directly controllable by an applied electric field (in-plane switching, when the voltage is applied, column 14, lines 30-36). Miyachi teaches that the orientation of the liquid crystal molecules of the bulk layer can perform out-of-plane switching (outside of the plane as being affected by the

voltage applied, column 14, lines 20-25), which means that the orthogonal projection of said surface-director on said substrate, termed projected surface-director, presents said preferred orientation in a geometrical plane in parallel with said substrate when no voltage is applied, which is the preferred field-off planar orientation of Applicant, and that the orientation of the liquid crystal molecules of said bulk layer is directly controllable by an applied electric field to perform an out-of-plane switching of said preferred field-off planar orientation of the projected surface-director to a field-induced out-of-plane orientation.

Regarding claim 6, Miyachi teaches that this out-of-plane switching is possible when the liquid crystal molecules of the bulk layer have positive dielectric anisotropy (column 14, lines 12-25). Miyachi fails to teach that the field-induced out-of-plane orientation is a field-induced vertical orientation.

However, Robinson teaches a liquid crystal device comprising at least one confining substrate (11, 12, Fig. 14, column 9, lines 1-10), and a liquid crystal bulk layer (18, Fig. 14, column 9, lines 44-46) presenting a surface-director at a bulk surface thereof, wherein an orthogonal projection of said surface-director on said substrate presents said preferred orientation in a geometrical plane in parallel with said substrate when the voltage is off, which is the preferred field-off planar orientation of Applicant (No field, Fig. 14), and the orientation of the liquid crystal molecules of said bulk layer is directly controllable by an applied electric field to perform an out-of-plane switching of said preferred field-off planar orientation of the projected surface-director to a field-induced vertical orientation (Applied field on, Fig. 14). Robinson teaches that this field-

induced vertical orientation provided by out-of-plane switching is done with liquid crystal molecules having positive dielectric anisotropy (column 10, lines 44-52), and provides a desired device modulation (column 10, lines 60-65).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made, to have provided a field-induced vertical orientation as the field-induced out-of-plane orientation for the liquid crystal molecules of the bulk liquid crystal layer in the liquid crystal device of Miyachi, in order to provide the desired device modulation, as taught by Robinson.

Regarding claims 7, 16, Miyachi teaches that when the liquid crystal molecules of the bulk layer has negative dielectric anisotropy, the liquid crystal molecules performs switching to a field-induced planar orientation (parallel to surface when the voltage is applied, column 14, lines 32-36). Furthermore, Miyachi teaches that the electric field is applied normally to said at least one confining substrate (vertical electric field, column 8, lines 1-5). Miyachi fails to teach that the orthogonal projector of said surface-director is on a geometrical plane perpendicular to the substrate, when the voltage is off, which is the preferred field-off vertical orientation of Applicant, and that the liquid crystal molecules of the liquid crystal bulk layer performs an out-of-plane switching from the field-off vertical orientation to a field-induced planar orientation.

However, Robinson teaches a liquid crystal device comprising at least one confining substrate (11, 12, Fig. 15, column 9, lines 1-10), and a liquid crystal bulk layer (18, Fig. 15, column 9, lines 44-46) presenting a surface-director at a bulk surface thereof, wherein an orthogonal projection of said surface-director is on a geometrical

plane perpendicular to said substrate, when the voltage is off (in the absence of an applied field, the liquid crystal molecules are aligned normal to the surface of the cell, column 10, lines 54-60, No field, Fig. 15), which is the preferred field-off vertical orientation of Applicant, and the orientation of the liquid crystal molecules perform an out-of-plane switching from the preferred field-off vertical orientation to a field-induced planar orientation (Applied field on, Fig. 15). Robinson teaches that this field-induced planar orientation provided by out-of-plane switching is done with liquid crystal molecules having negative dielectric anisotropy (rotate, column 10, lines 54-65), and provides a desired device modulation (column 10, lines 60-65).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made, to have provided a bulk liquid crystal layer for the liquid crystal device of Malachi, wherein the liquid crystal molecules with negative dielectric anisotropy, perform an out-of-plane switching from a field-off vertical orientation, where the orthogonal projector of the surface-director is on a geometrical plane perpendicular to the substrate, to a field-induced planar orientation, in order to provide the desired device modulation, as taught by Robinson.

Regarding claim 8, Miyachi teaches that the electric field is applied normally to said at least one confining substrate (vertical electric field, column 8, lines 1-5).

Allowable Subject Matter

4. Claims 5, 20 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. The closest cited prior art of record, US 6,985,200 fails to fairly teach or suggest, even in combination with US 5,973,817, a liquid crystal device comprising a liquid crystal bulk layer presenting a surface-director at a bulk surface thereof, and a surface-director alignment layer comprising side-chains arranged to interact with the bulk layer at said bulk surface for facilitating the obtaining of a preferred orientation of the surface-director of the bulk layer, wherein the orientation of the molecules of the liquid crystal bulk layer and the orientation of said side-chains of the surface-director alignment layer each is directly controllable by an electric field via dielectric coupling, and the surface-director alignment layer comprises structural parts exhibiting dielectric anisotropies of opposite signs. None of the references teach a surface-director alignment layer that comprises structural parts exhibiting dielectric anisotropies of opposite signs.

5. Claim 13 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, 2nd paragraph, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims. The closest cited prior art of record US 6,985,200 fails to fairly teach or suggest, even in combination with US 5,973,817, a liquid crystal device comprising a liquid crystal bulk layer presenting a

surface-director at a bulk surface thereof, and a surface-director alignment layer comprising side-chains arranged to interact with the bulk layer at said bulk surface for facilitating the obtaining of a preferred orientation of the surface-director of the bulk layer, wherein the orientation of the molecules of the liquid crystal bulk layer and the orientation of said side-chains of the surface-director alignment layer each is directly controllable by an electric field via dielectric coupling, wherein the surface-director alignment layer comprises a polymer which is a polyvinyl acetal, having a polymeric backbone and side-chains attached thereto, said polymeric backbone lacks directly coupled ring structures and at least some of the side-chains (i) comprises a least two unsubstituted and/or substituted phenyls coupled via a coupling selected from the group consisting of a carbon-carbon single bond (-), a carbon-carbon double bond containing unit (-C=C-), a methylene ether unit (-CH2O-), an ethylene ether unit (-CH2CH2O-), an ester unit (-COO-) and an azo unit (-N=N-), (ii) exhibits a permanent and/or induced dipole moment that in ordered phase provides dielectric anisotropy, and (iii) is attached to the polymeric backbone via at least two spacing atoms. None of the references teach that the polymer is a polyvinyl acetal having side-chains which have components (i)-(iii).

Any inquiry concerning this communication should be directed to Sow-Fun Hon whose telephone number (571)272-1492. The examiner can normally be reached Monday to Friday from 10:00 AM to 6:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Terrel Morris, can be reached on (571)272-1478. The fax phone number for the organization where this application or proceeding is assigned is (571)273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/Sophie Hon/

Sow-Fun Hon